Chapter 1
Introduction

1-1. Purpose

a. This publication describes study processes performed by U.S. Army Corps of Engineers (USACE) hydrologic engineers for Federal flood damage reduction projects. The goal is to enable Corps staff and cost-share partners to gain an understanding of hydrologic engineering procedures, including the study scope, strategies, and methods of analysis. With a common understanding, the study team members can clearly define and grasp the choices available for performing the hydrologic engineering study and arrive at a mutual agreement on study requirements.

b. Appropriate references to other pamphlets, manuals, documents, and texts are included if more detailed explanations are desired. References shown throughout this document may be found in Appendix A.

1-2. Applicability

This pamphlet applies to all HQUSACE elements, major subordinate commands, districts, laboratories, and field operating activities having civil works responsibilities.

1-3. Overview of Corps Flood Damage Reduction Studies

The Corps undertakes studies of water and related land resource problems from directives or authorizations issued by Congress. Congressional authorities are contained in public laws or in resolutions. Study authorizations are either for specific studies or for standing program authorities, such as the continuing authorities program. The focus of the studies is to determine whether a Federal flood damage reduction project should be recommended in accordance with Army policies. Corps studies for planning, engineering, and design of flood damage reduction projects are predicated on these legislative requirements and institutional policies (ER 1105-2-100 and EP 1105-2-10).

a. Planning studies.

(1) Project planning studies are conducted in two phases. The first phase, resulting in a reconnaissance report, is fully funded by the Federal Government. It normally requires 12 months for completion, determines if there is a Federal interest (benefits of the project exceed the costs for at least one alternative) and if there is non-Federal support (a local sponsor willing to cost-share). The hydrologic engineering analysis for the reconnaissance phase should establish existing condition hydrology if adequate time and funding are available. If the reconnaissance report is favorable, an Initial Project Management Plan is prepared to detail the time, cost, and work schedule necessary to complete all facets of the subsequent feasibility study. A Feasibility Cost-Sharing Agreement is signed with the local (non-Federal) sponsor.

(2) The feasibility phase is cost-shared equally between the Federal Government and non-Federal sponsor. It may take up to 4 years to complete and results in recommendations to Congress concerning Federal participation in reducing the flood problem identified in the study. This report contains the detailed hydrologic analysis necessary to determine the severity of the existing flood problem, and to evaluate the success of various alternatives in alleviating the problem. Detailed economics, plan formulation, and a baseline cost estimate for the recommended plan are also necessary in this phase. The feasibility report typically recommends the project which provides the maximum net benefits. The Project Management Plan is prepared late in the feasibility study to determine time and funding requirements for the detailed engineering design and construction phases following feasibility. A positive recommendation for Federal participation results in the project proceeding into preconstruction engineering and design (PED). The cost-sharing requirements for the recommended project and items of non-Federal sponsor cooperation are to be included in the feasibility report. Additional information concerning feasibility investigations is referenced in ER 1105-2-100 and ER 1110-2-1150.

b. PED studies.

(1) The PED phase continues design efforts following the feasibility study and encompasses the more detailed construction planning and engineering necessary for building the project. The major items resulting from the PED phase are design memoranda and plans and specifications.

(2) A design memorandum (DM) is the primary document developed in the PED phase. Detailed engineering and design are documented during preparation of the DM leading to construction of the project. The DM emphasis is on areas of structural analysis, soils testing and exploration, real estate analyses, cost engineering, etc. Where a project is large or has several major components, more than one design memorandum may be necessary.

(3) Following completion and approval of a DM, plans and specifications are prepared, which allow the project to be bid and constructed. For most projects, the PED phase is expected to be completed within 2 years.

(4) For projects where considerable time has elapsed since completion of the feasibility report or where conditions have changed enough to require project reformulation, a general design memorandum (GDM) may be necessary. The intent is to provide sufficient engineering analysis during feasibility, along with prompt and continuous funding into the PED phase, to preclude the need for a general reevaluation report. The feasibility report, along with the engineering appendices, should allow a smooth progression through PED for most projects. Additional information on the PED phase is referenced in ER 1110-2-1150.

c. Construction engineering and design. Once preconstruction engineering and design are complete, any remaining engineering and design are accomplished concurrent with construction activities. This phase includes the design memorandums and plans and specifications to construct any remaining project components. Construction of each project component occurs after completion of plans and specifications for that component.

d. Continuing authority studies. These standing study and construction authorities are conducted in a two-phase process. Additional information on continuing authority studies is available in ER 1105-2-100.

1-4. Hydrologic Engineering

a. Hydrologic engineering is a critical technical element in the planning of flood damage reduction measures and actions. It is a civil engineering discipline involving the analysis of water and its systems as it moves above, on, through, and beneath the surface of the earth as defined by the hydrologic cycle (See Figure 2-1). Hydrologic engineers have a major participatory role in defining the flood hazard, locating and sizing flood damage reduction projects, and determining and assuring the functional and operational integrity of the project.

b. Hydrologic engineers utilize data such as precipitation and streamflow in the planning, design, and operation of projects. Analysis techniques focus on determining the magnitude and frequency of hydrologic events (precipitation and streamflow) at locations of interest. The analysis approaches generally involve relating known measurements of these phenomena to study areas having little or no measured data. The techniques used include: information transfer, simplified methods, statistical computations, and computer program models of the hydrologic systems.

c. To understand the data requirements and the analytical approaches applied, one must grasp the basic concepts of flood analysis and data needs. Chapter 2 describes these processes. Subsequent chapters define the analytical methods used by the Corps to perform flood hazard analyses for with- and without-project conditions.